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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/604,415	07/18/2003	Albert Eugene Steinbach	839-1398	1414

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EXAMINER	
LEUNG, RICHARD L	

ART UNIT	PAPER NUMBER
3744	

DATE MAILED: 10/26/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/604,415	STEINBACH ET AL.	
	Examiner	Art Unit	
	Richard L. Leung	3744	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *18 July 2003*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-37* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-19,24,27 and 33* is/are rejected.

7)☒ Claim(s) *20-23,25,26,28-32 and 34-37* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *18 July 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 1-4 and 6 rejected under 35 U.S.C. 103(a) as being unpatentable over US 5749243 (Lester) in view of US 4404808 (Andeen). Lester discloses a low-temperature refrigeration system providing cryogenic fluid to an apparatus (instrument and cooling mount 11, 12) comprising a re-circulation device (pump 22), a passive cold storage device (thermal capacitor 16), a first portion of a fluid communication feed line (13) fluidly connecting the re-circulation device (22) to the passive cold storage device (16), a second portion (supply line 18) of the fluid communication feed line (13) fluidly connecting the passive cold storage (16) to the apparatus (11, 12), and a fluid communication return line (19) fluidly connecting the apparatus (11, 12) to the re-circulation device (22). See particularly Fig. 1 and column 9, lines 5-17. It is also demonstrated that the first portion of the fluid communication feed line (13) includes at least one heat exchanger (26, 27). See column 9, lines 42-52. While Lester discloses that the passive cold storage device (16) may comprise a solid material such as a metal (column 4, lines 59-60), Lester prefers the use of a cryogenic fluid reservoir and fails to expressly disclose that the cold storage device is a porous matrix of material that comprises a regenerative heat exchanger, metal wire mesh, or metal spheres. Andeen

teaches a regenerative heat exchanger that, as already well known in the art, is simply a thermal storage device capable of storing heat or cold. Though Andeen specifically teaches the use of a plastic material regenerative heat exchanger, Andeen also shows that the use of a regenerative matrix comprising metal mesh or metal spheres is already known and typical in the art. See column 2, lines 1-8. It would have been obvious to one of ordinary skill in the art at the time the invention was made to have replaced the fluid reservoir cold storage device disclosed by Lester with the regenerative porous matrix heat exchanger comprising metal mesh or spheres taught by Andeen because Lester expressly states that material such as metal may be used (column 4, lines 59-60), and the use of the porous matrix would be of simpler design than the fluid reservoir disclosed by Lester since one would not have to be concerned with the fluid handling aspects associated with the fluid reservoir.

3. Claims 1 and 5 are rejected under 35 U.S.C. 103(a) as being unpatentable over US 5749243 (Lester) in view of JP 11-051583 (Shizukuishi et al.). As already described above, Lester discloses all the limitations of the claims, except for having the cold storage device comprise a porous matrix, specifically comprising ceramic spheres. Shizukuishi et al. teach a thermal storage heat exchanger (10) comprising a porous matrix of ceramic balls (b). See the English abstract. While, as best understood, the thermal storage device (10) is specifically used to store heat, it should be noted that it is well known in the art that such thermal storage devices are capable of cold storage. It would have been obvious to one of ordinary skill in the art at the time the invention was made to have replaced the fluid reservoir cold storage device disclosed by Lester with

the thermal storage matrix of ceramic spheres taught by Shizukuishi et al. because Lester expressly states that solid materials may be used (column 4, lines 59-60), and the use of the solid porous matrix would be of simpler design than the fluid reservoir disclosed by Lester since one would not have to be concerned with the fluid handling aspects associated with the fluid reservoir.

4. Claims 7-10, 12-16, and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over US 6640552 B1 (Rampersad et al.) in view of US 4404808 (Andeen). Rampersad et al. discloses a system and method for providing a cooling fluid to an apparatus comprising cooling the fluid to a first temperature using a cryogenic refrigerator (7) when operating at a first refrigeration capacity and cooling the fluid to a second temperature when operating at a second (reduced) refrigeration capacity (column 4, line 5), the first temperature being lower than the second temperature and the first refrigeration capacity being higher than the second refrigeration capacity. The fluid is subsequently passed to a passive cold storage (ballast tank 11) through a first portion of a fluid communication line, the fluid cooling the passive cold storage (11) when the fluid has been cooled to the first temperature by the cryogenic refrigerator (7) operating at the first refrigeration capacity (column 3, lines 31-39), and the fluid being cooled by the passive cold storage (11) when the fluid provided to the passive cold storage (11) has been cooled to the second temperature by the cryogenic refrigerator (7) operating at the second (reduced) refrigeration capacity and while the refrigeration capacity of the cryogenic refrigerator (7) is being restored to the first refrigeration capacity (column 4, lines 1-10). There is furthermore a second portion of the fluid

communication feed line fluidly connecting the passive cold storage (11) to an apparatus (superconducting equipment 20) for communicating the fluid to the apparatus (20) as part of the fluid circuit. See particularly Fig. 1. Rampersad et al. use a ballast liquid (12) as the passive cold storage, and fail to disclose that the cold storage device is a porous matrix of material comprising a regenerative heat exchanger, metal wire mesh, or metal spheres. Andeen teaches a regenerative heat exchanger that, as already well known in the art, is simply a thermal storage device capable of storing heat or cold through direct contact with a working fluid. Though Andeen specifically teaches the use of a plastic material regenerative heat exchanger, Andeen also shows that the use of a regenerative matrix comprising metal mesh or metal spheres is already known and typical in the art. See column 2, lines 1-8. It would have been obvious to one of ordinary skill in the art at the time the invention was made to have replaced the ballast fluid cold storage disclosed by Rampersad et al. with the regenerative porous matrix heat exchanger comprising metal mesh or spheres taught by Andeen because the use of the solid porous matrix would be of simpler design than the ballast tank (11) disclosed by Rampersad et al. since one would not have to be concerned with the fluid handling aspects associated with the ballast fluid, such as the valves (14, 16) depicted by Rampersad et al.

5. Claims 7, 11, 13, and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over US 6640552 B1 (Rampersad et al.) in view of JP 11-051583 (Shizukuishi et al.). As already described above, Rampersad et al. disclose all the limitations of the claims, except for having the cold storage device comprise a porous

matrix, specifically comprising a porous matrix of ceramic spheres. Shizukuishi et al. teach a thermal storage heat exchanger (10) comprising a porous matrix of ceramic balls (b). See the English abstract. While, as best understood, the thermal storage device (10) is specifically used to store heat, it should be noted that it is well known in the art that such thermal storage devices are capable of cold storage. It would have been obvious to one of ordinary skill in the art at the time the invention was made to have replaced the fluid reservoir cold storage device disclosed by Rampersad et al. with the thermal storage matrix of ceramic spheres taught by Shizukuishi et al. because the use of the solid porous matrix would be of simpler design than the ballast tank (11) disclosed by Rampersad et al. since one would not have to be concerned with the fluid handling aspects associated with the ballast fluid, such as the valves (14, 16) depicted by Rampersad et al.

6. Claims 19, 24, 27, and 33 are rejected under 35 U.S.C. 103(a) as being unpatentable over US 6347522 B1 (Maguire et al.) in view of US 5749243 (Lester). Maguire et al. disclose a cooling method and system (10) for providing cryogenic fluid to an apparatus (17), the cooling system (10) comprising a re-circulation device (fans 21), a fluid communication feed line (27) connecting the re-circulation device (21) to the apparatus (17) for communicating the fluid to the apparatus (17), and a fluid communication return line (33) for communicating the fluid from the apparatus (17) back to the re-circulation device (21). The fluid communication line further includes a plurality of cryogenic refrigerators (cryocoolers 13) arranged in series. See particularly the Figure. Maguire et al. fail to expressly disclose that the fluid communication line

includes a first passive cold storage and a second passive cold storage device connected serially downstream from the first passive cold storage device, or that a first cryogenic refrigerator is thermally coupled to the first passive storage device and a second cryogenic refrigerator is thermally coupled to the second passive cold storage device. Lester teaches a similar system for providing cryogenic fluid to an apparatus (11) comprising a re-circulation device (pump 22), a fluid communication feed line (51) connecting the re-circulation device (22) to the apparatus (11) for communicating the fluid to the apparatus (11), and a fluid communication return line (19) connecting the apparatus (11) to the re-circulation device (22) for communicating the fluid from the apparatus (11) to the re-circulation device (22). Lester also teaches the inclusion of a passive cold storage device (thermal capacitor 16) in the fluid communication line, which is thermally coupled to a cryogenic refrigerator (14). It would have been obvious to one of ordinary skill in the art at the time the invention was made to have thermally coupled each of the cryogenic refrigerators (13) in the system disclosed by Maguire et al. with a passive cold storage device, as in the arrangement taught by Lester, because Lester expressly teaches that use of such a storage device (thermal capacitor) allows the cooling system to deliver an output which can be varied to match the varying thermal load of the apparatus (column 8, lines 14-16). Furthermore, it should be noted that Maguire et al. expressly discloses the desire for redundancy in the system (column 2, lines 35-40), which would suggest motivation for coupling a separate cold storage device to each of the cryogenic refrigerators (13) in the system.

Allowable Subject Matter

7. Claims 20-23, 25, 26, 28-32, and 34-37 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Conclusion

8. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

US 3630043 (Mulder): discloses an apparatus and method for cooling an object comprising a circuit for transporting refrigerating fluid from a cold source to the object and further comprising a regenerator as a passive cold storage device.

US 4874677 (Reiche et al.): discloses a regenerator comprising a porous matrix of metal mesh.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Richard L. Leung whose telephone number is 703-306-4154. The examiner can normally be reached on Mon-Fri.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Denise L. Esquivel can be reached on 703-308-2597. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Richard L. Leung
Examiner
Art Unit 3744

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